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ABSTRACT

Children learn sex-appropriate behavior through the influences of parents, teachers and the media. This study examined the most popular medium, television, and in particular television cartoons and their influence on children's attitudes toward science and technology. The amount and types of science and technology, along with the types of participation of male and female characters in scientific activities were examined in four television cartoons. The cartoons' characters were evaluated according to the following criteria: (1) intent of use of science and technology; (2) consequences/rewards of behavior; (3) locus of control; (4) attributions of success; (5) physical state; (6) physical activity; (7) intellectual activity; (8) social activity; and (9) emotional activity. Results revealed that most characters in the cartoons were males who used science and technology often, usually while being aggressive. When female characters were shown, they were portrayed as both able and prosocial, using science and technology for the good of others. Female characters were also more sharing and caring, and were less angry, fearful, and violent than male characters. The findings suggest that the portrayal of female characters as competent may be successfully linked with the tendency to also show them as prosocial. Despite the positive portrayal of female characters, however, their appearance was rare and they were usually not the main focus of action. Contains 34 references and four tables. (Author/JA)

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Sex Differences in the Use of Science and Technology in Children's Cartoons

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Abstract

Television is among the many mechanisms that transmit information about sex-appropriate behavior to children. In order to examine whether television cartoons portray male and female characters using science and technology in a different manner, we examined the amount and type of science and technology utilized by characters in popular children's cartoons. Results revealed that most characters in these cartoons were male who were often depicted using science and technology, usually while being aggressive. When female characters were shown, they were portrayed as both able and prosocial, using science and technology for the greater good of others, rather than for destruction. In addition, female characters performed prosocial behaviors such as caring and sharing, and were less angry, fearful, and violent than were male characters. Our findings suggest that the portrayal of female characters as competent may be successfully linked with the tendency to also show them as prosocial. Despite relatively positive portrayal of female characters, however, their appearance was rare and most likely not the main focus of the action.

Sex Differences in the Use of Science and Technology in Children's Cartoons

Is the paucity of women in high-paying science, technological, and math-related fields a function of lack of desire, lack of ability, tacit or explicit penalties for sex-role reversals, or a combination of many complex social causes? Given that fewer than 18% of the employed Ph.D.s in science and engineering are women (Lips, 1992; Trankina, 1993) the reasons for the disparity in science representation has been the subject of a great deal of speculation, as well as research that has focused on sources such as perceptions of the sex-appropriateness of certain fields, actual skill and ability differences, teacher and parent expectations, and other socialization mechanisms, including television.

Certain fields are generally perceived as either masculine or feminine, and these perceptions affect liking during school years and influence adult pursuit of training and employment in those fields. For example, science, math, and information technology are seen as masculine, whereas education, and social/humanistic subjects are judged as feminine (Acker & Oatley, 1993; Colley, Comber, & Hargreaves, 1994). Computer science (and its related games) are seen as the primary domain of boys (Cooper, Hall, & Huff, 1990). Women--regardless of their age, life history, cohort, and educational attainment--generally possess a less positive view of science than do men, and report that they are less able in science fields (Acker and Oatley, 1993; Lips, 1992; Mallow, 1994; Potts & Martinez, 1994). Conceptualizing science as difficult affects whether women choose to study science, as many girls view science as a subject that must be endured in order to get through school, and don't see science as a discovery-oriented field that is interesting and helpful in all aspects of life (Kahle, Parker, Rennie, & Riley, 1993; Ledbetter, 1993).

The perception that certain fields "belong" to men and women may influence

girls' and womens' judgments about their abilities to do science and math, as efficacy beliefs affect actual performance (Williams, 1994). For example, actual ability in math (as measured by the SAT) does not predict the tendency to go into scientific careers as strongly as does math anxiety, suggesting that beliefs about abilities (which are related to views about the sex-appropriateness of fields) may be the key determinant in discouraging pursuit of science (Chipman, Krantz, & Silver, 1992). Attributions regarding success and failure in science also vary according to efficacy beliefs, as an external attribution for success in science and internal attribution for failure is likely for women (Acker & Oatley, 1993; Trankina, 1993). Are these patterns a function of actual ability differences? Or are there a number of other social mechanisms that transmit to children beliefs about the sex-appropriateness of scientific study?

There are some sex differences in cognitive abilities that may impact abilities in math and science fields. A recent meta-analysis of sex differences in spatial abilities indicated male superiority for some tests (particularly those concerned with mental rotation), but not for others; and these sex differences do seem to be lessening as time goes on (Voyer, Voyer, & Bryden, 1995). However, women's lesser abilities to perform mental rotation tasks should not be enough to keep women out of science fields that have a strong foundation in math, as less ability on isolated math tasks does not indicate a total lack of ability. Thus, the differential pursuit of science that begins in grade school and continues through career choice is more a function of socialization and culturally-accepted definitions about what which fields are most appropriate for men and women (Linn & Hyde, 1989), as well as explicit advice regarding careers in science and technology (Rennie & Dunne, 1994). Although a large number of women are going into the biological sciences, women still lag far

behind men in the pursuit of chemistry and physics (Mallow, 1994), owing perhaps to early performance differences in physics (Räsänen, 1991). Compounding the problem, research findings about sex differences in cognitive abilities that are reported in the media may be exaggerated by the lay public, promoting a view that somehow women are innately less capable than are men to achieve in science and math (Trankina, 1993).

Given that actual sex differences in ability are negligible, it is likely that other agents provide information to children about what is and is not appropriate for men and women. Children are aware of how people of different sexes are the same and different, and despite repeated attempts to eliminate sex-role stereotyping, children's sex-role perceptions have changed little in the past 25 years (Floyd, 1994). Parents' beliefs about sex-related abilities is a primary determinant of children's sex-stereotyping, and parents also tend to view their daughters as less apt in masculine domains (such as math and science), but as more socially skilled. More importantly, these parental judgments impact children's self-perceptions of their abilities more strongly than do actual past school performances (Jacobs & Eccles, 1992). In addition to tacit or explicit transmittal of sex-appropriate behavior to children by parents, adult roles influence children. For example, children will model same-sex behaviors (McArthur & Eisen, 1976a) even if sex-role incongruent (Raskin & Israel, 1981), although it is more difficult to get children to remember these behaviors because they don't fit into their sex-role schema (Bigler & Liben, 1990). Thus, parental views and behaviors, both of which conform to sex-role expectations, influence children.

The sex-appropriateness of science is also transmitted by teachers, who often see science as incompatible with the feminine sex role (Kahle et al., 1993), perceive that

boys have more talent than do girls in math and science (Jussim & Eccles, 1992; Shepardson & Pizzini, 1992), and believe that girls must expend more effort on scientific study than boys (Jussim & Eccles, 1992). These perceptions impact both teachers' behavior toward students, as well as student performance, particularly because many female elementary school teachers themselves find science and scientific concepts overwhelming, and subsequently pass this apprehension along to their students. For example, teachers call on girls less often than boys for hands-on demonstrations, do not ask girls many questions that require integration and critical thinking (Shepardson & Pizzini, 1992), and are more interactive with boys (Kahle et al,. 1993). Teacher attention to boys and boys' subsequent interest and performance strengthens these beliefs; eventually teacher expectations are grounded in reality as those they believe are better in science actually are stronger in this area (Jussim & Eccles, 1992). This trend is further reinforced at the high-school and college level, where there are relatively few women teacher/professors to serve as role models, and where the science laboratory may be inhospitable to women (Trankina, 1993), leading many women with a scientific interest to pursue the social sciences instead (Acker & Oatley, 1993).

Another socialization mechanism is the media, which delineates sex roles in traditional children's literature (McArthur & Eisen, 1976b), through "superhero" portrayal (Young, 1993), and in the most popular medium, television. Although children eventually realize that what is on television is either not real or only approximates reality, they nonetheless remain influenced by what is portrayed, as schemas about social roles and reality are formed by what they are shown on television (Fitch, Huston, & Wright, 1993). Moreover, distorted images, when repeated, become part of social reality (Potts & Martinez, 1994). For example, those

children who watch educational programming where men and women are typically portrayed in a fairly egalitarian manner have weaker sex stereotypes (Repetti, 1984).

Many studies of sex-role stereotyping on television have focused on commercials, as about one-third of the time devoted to popular children's cartoons is given over to commercials ("The Best and Worst of Saturday Morning," 1992), and because children see approximately 300,000 ads before they reach adolescence (Boush, Friestad, & Rose, 1994). Commercials send a clear message about appropriate sex roles, and vary in content depending on who is probably watching (Craig, 1992). For example, women appear as focus figures less often than do men (McArthur & Eisen, 1976a; McArthur & Resko, 1975; Ogletree, Williams, Raffeld, Mason, & Fricke, 1990), and when they are shown they are unlikely to be portrayed as experts (Brownlow & Zebrowitz, 1990; McArthur & Resko, 1975). Toy ads contain messages that reinforce sex-role stereotyping, as ads including boys show boys as goal-directed, and ads with all girls are heavily laden with emotional content (Rajecki, Dame, Creek, Barrickman, Reid, & Appleby, 1993).

Given the impact of television as one mechanism to transmit information about sex-role expectations and occupations (Fitch et al., 1993) a study of sex differences in the portrayal of science and technology is necessary, as there exists little literature about the scientific content of children's cartoons. We hypothesized that examination of science and technology use in cartoons would show a prevalence of male characters using science and technology, with female characters portrayed as assistants who focus on the social aspects of interactions with others.

Method

Sample

Multiple episodes of four Saturday morning cartoon programs shown on the Fox

network were recorded on videotape. These four shows were X-Men, Iron Man, Spiderman, and Battletech. Each cartoon displayed human or human-like male and female characters using science or some form of technology. Eight one-minute segments were edited from each cartoon, and up to four major characters (those with predominant on-screen time) in each segment were chosen to have their actions and behaviors analyzed. An experimenter who did not participate in coding the cartoons watched all the cartoons and designated which characters were to be coded in each clip. The final sample was comprised of 240 one-minute segments, depicting 610 total characters (171 in Battletech, 155 in X-Men, 176 in Spiderman, and 168 in Ironman).

Dependent Measures

Nine major categories of character behaviors and states were coded, and some of these (physical state, social and emotional behavior) were adapted from McArthur and Eisen (1976a). In all cases, a behavior or state that did not readily fit the coding categories was judged as "none" or "other." These major categories were classified and interpreted as follows:

General information. The *sex* of each character was noted, as was the *setting* of each segment (inside or outside). The *importance* of the character within the clip was judged as either major or minor. The primary *role* of characters was coded as good, bad, or neutral. Good roles were assigned when characters appeared as heroes, friends, and helpers; bad roles included villains, mean, and/or bad people. Neutral role was indicated if a character was neither clearly good nor bad. The *occupation* of each character was categorized as either scientist, scientist's assistant (helper to the scientist), victim (person in a negative, forced position), soldier (any military personnel), nonscientist (those not superheroes or scientists), business/professional,

or homemaker.

Intent of use of science and technology. If the *intent* of the use of science or technology was primarily to benefit the self, even if the outcome reward was positive and benefited others, the use was classified as for the self. However, positive intent was noted if the use of science was for the benefit of other people, even if bad people were harmed. When the science/technology was for the destruction or hurt of good people, it was classified as negative.

Consequences/rewards. Positive *consequences* or outcomes of the use of science/technology were coded when the character benefited or gained rewards, whereas negative outcomes indicated science and technology did not result in either individual or collective benefit, or that nothing positive was gained.

Locus of control. The primary cause for individual success or failure was classified in a general way as either *internal or external locus*, depending on the character's locus of control over the situation. Internal locus was noted when control was physical or mental and the characters had command over what they were doing. External locus was indicated when the characters had no mastery of the situation.

Attributions for success. The *attribution* for any character's success was classified as either luck (positive or negative things occurred for reasons outside the control of the character), skill (positive or negative things resulted from the ability to perform a task), effort (positive or negative occurrences happened because of motivation to accomplish something), and task difficulty (positive or negative outcomes were a function of easy or unchallenging tasks).

Physical state. The *physical state* was defined as the appearance and the condition of the character, and included the character's own or other characters' declarations

regarding state ("declared state"), as well as raters' judgments of state ("observed state"). A positive state was recorded when a character was attractive, and/or in good health, whereas a negative state was coded if there were feelings of pain, thirst, sweat, fatigue, hunger, stress, or unattractiveness. An out-of-the-ordinary state was indicated when the character had abnormal physical traits, was weird, or was mutant.

Physical activity. The *physical behaviors and actions* of the character during the clip were also noted. Fighting was recorded when characters engaged in battles using weapons, fists, mind power, or supernatural powers. Use of computers was operationalized as physically operating computers or robots. Flying was another aspect coded, and was noted only if flight was supernatural (i.e., without aids). Driving/piloting/aviating was recorded when characters operated or directed a vehicle of any sort. More than one activity could have been coded for each character when necessary.

Intellectual/cognitive activity. The types of *cognitive and intellectual skills* displayed by characters were classified on a number of dimensions. Problem solving was noted if a character found a solution to a problem using knowledge or reasoning. If a character asked for information or responded to questions, then asking or answering questions was noted. Explaining was recorded if a character expanded on a comment, and interpretation/analysis was noted if a character synthesized information or used critical thinking to understand.

Social activity. Activities that involved one character interacting with others were noted as *social activity*. If characters started an action alone, taking leadership or initiative, they were noted as being autonomous. Characters who were physically abusive (i.e., smacking, pushing, attacking, or hitting others) were recorded as

aggressive. If a character showed alliance, nurturance, or was caring for or sharing with another character, then concordance was noted. However, if the characters were giving commands to others or refusing to do as told, or declined to share or obey the law, they were considered discordant.

Emotional activity. The primary *emotions* expressed by the characters were recorded along several dimensions. If the characters expressed confidence and assurance of their own feelings, self confidence was noted. If characters expressed joy through chuckling, smiling, or laughing, or if they showed general enjoyment and satisfaction, they were coded as happy. If characters demonstrated concern, suspicion, dread, horror, or fright, expressed by shaking, crying, or quivering, they were classified as being in fear. Anger was another emotion coded and was noted when characters expressed dislike, hostility-animosity, hatred, or fury toward someone or something, expressed in gestures such as complaining, swearing, or fist shaking. If characters expressed uncertainty or lack of trust, doubt was recorded.

Coding Procedure and Reliability

Three raters coded sample practice cartoons according to the established criteria. Sixteen one-minute segments from Ironman, X-Men, Spiderman, and Battletech were used to perfect the coding procedure and establish reliability. The three raters discussed the coding categories and then worked individually on the practice sample.

Percent agreement (number or agreements/number of disagreements + number of disagreements x 100) was calculated between each pair of raters in the three-rater set. All reliabilities were greater than .80, and mean agreement among the three rater pairs for each measure ranged from .83 to 1.00 (M = .93). Given acceptable reliability, the cartoons were divided among the three raters and coded individually.

Results

Overview

Chi squares comparing males and females on various dimensions within each coding category were used to analyze the data. The percentages from these analyses are located in Tables 1-4. Total N in each chi-square analysis varied because characters occasionally did not perform any of the target behaviors (i.e., indices of "none" and "other" are not included in these analyses).

Characteristics of the Sample

As expected, most characters (519, or 77%) were male, which is not surprising considering that the shows comprising the sample were oriented around male characters. The highest proportion of female characters was seen in X-Men (30%) and Battletech (26%); relatively few females were seen in Ironman (20%) and even fewer were found in Spiderman (16%), $\chi^2(3, N = 670) = 10.76, p < .02$.

Percentages from chi-square analyses concerning general characteristics of the sample are located in Table 1. A higher proportion of males were major (rather than minor) characters as compared to females, $\chi^2(1, N = 670) = 5.67, p < .02$. A higher proportion of roles held by females were good in comparison to males, who typically held bad or neutral roles, $\chi^2(2, N = 669) = 27.74, p < .001$. Surprisingly, both male and female characters were portrayed most often as soldiers, and were equally portrayed as scientists, as about 16% of their respective roles could be described as such. However, more female characters were shown as scientist assistants, non-scientists, and homemakers, whereas males were portrayed as business professionals, $\chi^2(6, N = 403) = 41.71, p < .001$. The setting or location of the segments was not related to character sex, $\chi^2(2, N = 661) < 1$, ns.

Use of Science and Technology

Information pertaining to the intent of use of science/technology and rewards and consequences for its use is located in Table 2. When female characters used science/technology, the use was proportionally more likely to be for positive reasons, whereas for male characters the use was more likely to be for negative reasons, $\chi^2(2, \underline{N} = 454) = 13.03, \underline{p} < .002$. In those instances where there was an obvious outcome or consequence from the use of science/technology, positive outcomes (benefits to self, others, society) were more likely to be seen for female characters, whereas for male characters the outcome was usually negative (i.e., there was no good outcome for any person), $\chi^2(1, \underline{N} = 283) = 14.00, \underline{p} < .001$.

Locus of Control and Attributions

As can be seen in Table 3, both male and female characters showed a predominantly internal locus of control, although this tendency was more pronounced for female characters, $\chi^2(1, \underline{N} = 670), \underline{p} < .05$. Moreover, most characters attributed their successes to skill, although a higher proportion of females than males attributed their success to luck and more males than females credited their own effort, $\chi^2(3, \underline{N} = 648), \underline{p} < .05$.

Physical State

The percentages from the chi-square analysis of the character's physical state are located in Table 4. Very few characters made self-referent comments about their physical state or had other characters make similar comments ("declared state"), and character sex was not related to the tendency to do so, $\chi^2(2, \underline{N} = 161) < 1, \underline{ns}$. However, the actual "observed" state of the characters did show a relationship with character sex, $\chi^2(2, \underline{N} = 663) = 7.36, \underline{p} < .05$. Most characters were in a positive physical state, although a higher proportion of females were positive and more

male characters were negative or out-or-ordinary.

Character Activity

The frequencies from the chi-square analyses of social, physical, intellectual, and emotional activity can be seen in Table 4. Not surprisingly, female characters generally performed concordant social activities, although they were also shown using aggression almost one-fourth of the time. However, male characters were shown aggressing as often as they were portrayed being concordant, $\chi^2(3, N = 622) = 31.33$, $p < .001$. Surprisingly, no character sex differences emerged for physical activities, $\chi^2(3, N = 435) = 3.83$, ns, as female and male characters were both typically depicted using computers.

The chi-square to examine character sex differences in intellectual activity was marginally significant, $\chi^2(4, N = 618) = 9.00$, $p = .06$. Although most characters were shown explaining something to others, this tendency was more pronounced in female characters. Both male and female characters answered questions and analyzed equally, but more male characters asked for information and actively solved problems. Finally, female characters showed slightly different emotions than did male characters, $\chi^2(4, N = 537) = 11.36$, $p < .05$. Male characters showed more anger than did female characters, but female characters were more often self-confident. Fear was predominant among all characters, but was approximately equal between male and female characters, whereas more female than male characters showed happiness.

Discussion

The results of this study showed a predominance of male action figures using science and/or technology, typically while being aggressive. However, when female figures were shown, they were portrayed as both competent and socially skilled.

Specifically, they used computers as often as did males, and were shown using technology as often, although they tended to use the science and technology for the greater good of others, rather than for destruction. The finding that female characters used technology to help others is inconsistent with previous research that has indicated that the female superheroes are less likely to be called upon to restore order despite their equal competency (Young, 1991). However, the Young sample was drawn from comic books, a notoriously male-oriented medium.

Also congruent with the literature (cf. McArthur & Eisen, 1976a; McArthur & Resko, 1975) were the results regarding the social and intellectual activities of the characters, as female characters were better looking, likely to perform concordant social activities such as caring and sharing, and less aggressive and angry than were male characters. Although consistent with sex-role stereotypes regarding the proclivities and strengths of men and women (cf. Floyd, 1994; Repetti, 1984), these findings suggest that the portrayal of female characters as prosocial may be successfully paired with the tendency to depict female characters as competent users of science and technology. However, the appearance of female characters (although positive on all dimensions) was rare, and most likely not the main focus of the action.

Consistent with research on attribution patterns (e.g., Acker & Oatley, 1993), female attributions for successful endeavors were to luck, while males' attributions were to skill. In addition, female characters showed self-confidence, which is puzzling considering that attributions for their subsequent successes were mostly to luck.

Despite the fact that television is one medium that can help to reduce sex-stereotypical beliefs (Gash & Morgan, 1993; Repetti, 1984), it is unlikely that these

particular shows may influence girls' beliefs about their science abilities. First, the shows may not appeal to girls because of the lack of central female figures, leaving few same-sex role models for them to copy (Raskin & Israel, 1981). Moreover, counterstereotypic models need to be made salient and need to be fairly constant in the environment to have any behavioral impact (Gash & Morgan, 1993). Second, the preponderance of violent themes within these cartoons may prevent parents from recommending these shows to their children, as the violent content probably outweighs any potential benefits from seeing women portrayed in a fairly capable manner. The heavy focus on science fiction in these shows may prevent teachers and other potential role models from pointing to these cartoons as a source of information about science.

One major problem regarding the generalizability of these results concerns the operationalization of <u>science</u> in these cartoons. Although these particular cartoons were chosen because they have a scientific-technological focus, we may question whether technology, although related and important to science, is equated with science. Specifically, these shows were geared around computers, flying machines, laser beam usage, and the triumph of good over evil through heroic behaviors. However, the characters performing these behaviors may not have been viewed as scientists or scientific in the traditional sense, as the typical scientist (while generally viewed positively) is seen as a man clad in a white coat, toiling in a laboratory (Potts & Martinez, 1994). Although most of the characters were at least human-like, they may not have been viewed as humans per se, and this variation may have functioned according to sex of character, as the major foci of these shows were male characters who were generally less-human than minor surrounding characters (i.e., Spiderman). Thus, we most likely examined how technology (rather than science)

is depicted in cartoons, and the link between technology and science may be tenuous at best for the children who regularly watch these shows.

Another consideration in evaluating these findings is the target audience of these shows. These cartoons (and, by observation, their corresponding commercials) were geared toward boys and their activities and preferences. Unfortunately, there are few if no cartoons that have a scientific and/or technological theme and that depict male and female characters equally. Thus, the positive portrayal of female characters as able and socially-skilled (albeit only supporting of major male roles) may not be seen by many young girls.

References

Acker, S., & Oatley, K. (1993). Gender issues in education for science and technology: Current situation and prospects for change. Canadian Journal of Education, 18, 255-272.

Best and worst of Saturday and Sunday morning tv. (1992, February/March). Zillions, 2, 22-24.

Bigler, R. S., & Liben, L. S. (1990). The role of attitudes and interventions in gender-schematic processing. Child Development, 61, 1440-1452.

Boush, D. M., Friestad, M., & Rose, G. M. (1994). Adolescent skepticism toward TV advertising and knowledge of advertiser tactics. Journal of Consumer Research, 21, 165-175.

Brownlow, S., & Zebrowitz, L. A. (1990). Facial appearance, gender, and credibility in television commercials. Journal of Nonverbal Behavior, 14, 51-60.

Chipman, S. F., Krantz, D. H., & Silver, R. (1992). Mathematics anxiety and science careers among able college women. Psychological Science, 3, 292-295.

Colley, A., Comber, C., & Hargreaves, D. J. (1994). Gender effects in school subject preferences: A research note. Educational Studies, 20, 13-18.

Cooper, J., Hall, J., & Huff, C. (1990). Situational stress as a consequence of sex-stereotyped software. Personality and Social Psychology Bulletin, 16, 419-429.

Craig, R. S. (1992). The effect of television day part on gender portrayals in television commercials: A content analysis. Sex Roles, 26, 197-211.

Fitch, M., Huston, A. C., & Wright, J. C. (1993). From television forms to genre schemata: Children's perceptions of reality television. In G. L. Berry and J. K. Asamen (Eds.), Children and television: Images in a changing sociocultural world (pp. 38-52). Newbury Park, CA: Sage.

Floyd, K. (1994). Perceptions of gender similarities and differences in fifth-grade students. Psychological Reports, 74, 689-690.

Gash, H., & Morgan, M. (1993). School-based modifications of children's gender-related beliefs. Journal of Applied Developmental Psychology, 14, 277-287.

Jacobs, J. E., & Eccles, J. S. (1992). The impact of mothers' gender-role stereotypic beliefs on mothers' and childrens' ability perceptions. Journal of Personality and Social Psychology, 63, 932-944.

Jussim, L., & Eccles, J. S. (1992). Teacher expectations II: Construction and reflection of student achievement. Journal of Personality and Social Psychology, 63, 947-961.

Kahle, J. B., Parker, L. H., Rennie, L. J., & Riley, D. (1993). Gender differences in science education: Building a model. Educational Psychologist, 28, 379-404.

Ledbetter, C. E. (1993). Qualitative comparison of students' constructions of science. Science Education, 77, 611-624.

Linn, M., & Hyde, J. S. (1989). Gender, mathematics, and science. Educational Researcher, 18, 17-19, 22-27.

Lips, H. M. (1992). Gender and science-related attitudes as predictors of college students' academic choices. Journal of Vocational Behavior, 40, 62-81.

Mallow, J. V. (1994). Gender-related science anxiety: A first binational study. Journal of Science Education and Technology, 3, 227-238.

McArthur, L. Z., & Eisen, S. V. (1976a). Television and sex-role stereotyping. Journal of Applied Social Psychology, 6, 329-351.

McArthur, L. Z., & Eisen, S. V. (1976b). Achievements of male and female storybook characters as determinants of achievement behavior by boys and girls. Journal of Personality and Social Psychology, 33, 467-473.

McArthur, L. Z., & Resko, B. G. (1975). The portrayal of men and women in American television commercials. Journal of Social Psychology, 97, 209-220.

Ogletree, S. M., Williams, S. W., Raffeld, P., Mason, B., & Fricke, K. (1990). Female attractiveness and eating disorders: Do children's television commercials play a role? Sex Roles, 22, 791-797.

Potts, R., & Martinez, I. (1994). Television viewing and children's beliefs about scientists. Journal of Applied Developmental Psychology, 15, 287-300.

Rajecki, D. W., Dame, J. A., Creek, K. J., Barrickman, P. J., & Reid, C. A. (993). Gender casting in television toy advertisements: Distributions, message content analysis, and evaluations. Journal of Consumer Psychology, 2, 307-327.

Räsänen, L. (1991). Girls and the learning of physical concepts. The Finnish Journal of Education, 22, 185-194.

Raskin, P. A., & Israel, A. C. (1981). Sex-role imitation in children: Effects of sex of child, sex of model, and sex-role appropriateness of modeled behavior. Sex Roles, 7, 1067-1077.

Rennie, L. J., & Dunne, M. (1994). Gender, ethnicity, and students' perceptions about science and science-related careers in Fiji. Science Education, 78, 285-300.

Repetti, R. L. (1984). Determinants of children's sex stereotyping: Parental sex-role traits and television viewing. Personality and Social Psychology Bulletin, 10, 457-468.

Shepardson, D. P., & Pizzini, E. L. (1992). Gender bias n female elementary teachers' perceptions of the scientific ability of students. Science Education, 76, 147-153.

Trankina, M. L. (1993). Gender differences in attitudes toward science. Psychological Reports, 73, 123-130.

Voyer, D., Voyer, S., & Bryden, P. (1995). Magnitude of sex differences in spatial abilities: A Meta-analysis and consideration of critical variables. Psychological Bulletin, 117, 250-270.

Williams, J. E. (1994). Gender differences in high school students' efficacy-expectation/performance discrepancies across four subject matter domains. Psychology in the Schools, 31, 232-236.

Young, T. J. (1993). Women as comic book super heroes: The "weaker" sex in the Marvel universe. Psychology, a Journal of Human Behavior, 30, 49-50.

Table 1
Characteristics of the Sample

	Character sex	
	Male	Female
Character Importance*	n = 519	n = 151
Major	366 (71%)	91(60%)
Minor	153 (29%)	60 (40%)
Role*	n = 519	n = 150
Good	273 (53%)	115 (77%)
Bad	176 (34%)	26 (17%)
Neutral	70 (13%)	9 (6%)
Occupation*	n = 308	n = 95
Scientist	49 (16%)	16 (17%)
Scientist Assistant	10 (3%)	11 (12%)
Victim	34 (11%)	10 (11%)
Soldier	164 (53%)	37 (39%)
Non-Scientist	17 (6%)	10 (11%)
Homemaker	0 (0%)	7 (7%)
Business Professional	34 (11%)	4 (4 %)

Note. The n for male and female characters varies for each analysis. Percentages reflect proportions within sex of character and do not always total 100% due to rounding. An asterisk denotes a significant chi-square outcome, $p < .05$.

Table 2

Frequency of Male and Female Characters' Use of Science and Technology

	Character sex	
	Male	Female
Intent of Use*	n = 351	n = 103
Self	65 (19%)	13 (13%)
Positive	168 (48%)	70 (68%)
Negative	118 (34%)	20 (19%)
Consequences of Use*	n = 211	n = 72
Positive	84 (40%)	47 (65%)
Negative	127 (60%)	25 (35%)

Note. The n for male and female characters varies for each analysis. Percentages reflect proportions within sex of character and do not always total 100% due to rounding. An asterisk denotes a significant chi-square outcome, $p < .05$.

Table 3

Male and Female Characters' Locus of Control and Attributions for Success

	Character sex	
	Male	Female
Locus*	n = 519	n = 151
Internal	455 (88%)	141 (93%)
External	64 (12%)	10 (7%)
Attributions*	n = 504	n = 144
Luck	13 (3%)	7 (5%)
Skill	423 (84%)	129 (90%)
Effort	59 (12%)	6 (4%)
Task	9 (2%)	2 (1%)

Note. The n for male and female characters varies for each analysis. Percentages reflect proportions within sex of character and do not always total 100% due to rounding. An asterisk denotes a significant chi-square outcome, $p < .05$.

Table 4

Male and Female Characters' Physical and Activities

	Character sex	
	Male	Female
Declared Physical State	n = 132	n = 29
Positive	46 (35%)	9 (31%)
Negative	77 (58%)	19 (66%)
Out-of-Ordinary	9 (7%)	1 (3%)
Observed Physical State*	n = 514	n = 149
Positive	330 (64%)	112 (75%)
Negative	100 (19%)	24 (16%)
Out-of-Ordinary	84 (16%)	13 (9%)
Social Activity*	n = 475	n = 147
Autonomous	43 (9%)	19 (13%)
Aggression	189 (40%)	33 (22%)
Concordant	183 (39%)	89 (61%)
Discordant	60 (13%)	6 (4%)
Physical Activity	n = 346	n = 89
Using Computers	160 (46%)	44 (49%)
Fighting	154 (45%)	32 (35%)
Flying	25 (7%)	9 (10%)
Driving/Piloting	7 (2%)	4 (4%)

(table continues)

Intellectual Activity**	n = 478	n = 140
Problem Solving	79 (17%)	14 (10%)
Answering Questions	77 (16%)	21 (15%)
Asking Questions	110 (23%)	26 (19%)
Explaining	173 (36%)	69 (49%)
Analyzing	39 (8%)	10 (7%)
Emotional Activity*	n = 414	n = 123
Self-Confidence	112 (27%)	38 (31%)
Happiness	33 (8%)	19 (15%)
Fear	94 (23%)	29 (24%)
Anger	138 (33%)	25 (20%)
Doubt	37 (9%)	12 (10%)

Note. The n for male and female characters varies for each analysis. Percentages reflect proportions within sex of character and do not always total 100% due to rounding. An asterisk denotes a significant chi-square outcome, $p < .05$; two asterisks indicate a marginally significant effect, $p = .06$.